A DEVICE FOR UNDERPRESSURE-ACTIVATED DISPENSING OF FLUIDS

The present invention regards an underpressure-activated valve mechanism for controlled dispensing of fluids, including liquid food articles, from a receptacle. When the user applies sufficient suction force P2 across a pressure comparative diaphragm zone a valve opening force is applied to a valve area that has a force connection with the diaphragm zone. When the suction force ceases the valve area closes and remains closed, even in the event of overpressure P3 in the receptacle.

The patent literature describes a number of devices that seek to achieve underpressure-activated dispensing of fluids from a receptacle. Norwegian patent application no. 2002-5957 provides an example: Here, during activation, a valve actuating force arises as a result of a pressure differential across a diaphragm. The force is here transferred to a valve in the form of rotation and/or axial motion. A device utilizing this principle must consist of at least two parts capable of relative motion with respect to each other. There are also other devices where opening and closing occurs by mechanical movement, but these devices will not be able to provide automatic opening and closing of the valve, which may lead to inadvertent dispensing (spillage). All the above

devices are complex and so can be expected to be relatively costly.

The object of the present invention is to remedy the disadvantages of prior art. The object is achieved by the characteristics stated in the description below and in the following claims.

According to the invention the object is achieved by replacing the prior art valve with an elongated valve zone that has a force exchange connection with an elongated diaphragm zone. The diaphragm zone can be part of the outer pipe, as can the valve zone. With this it becomes possible to extrude the entire device in one piece without using particularly advanced technology.

The present invention comprises said pipe, wherein one or more axial diaphragm zones and one or more axial valve zones are formed in the longitudinal direction of the pipe. The principal differentiation is between using the inner or outer valve zone, although technically the invention may be constructed in different ways and with a combination of these methods. It is possible then to use several valve zones and/or diaphragm zones and connected partitions, but for simplicity these will hereinafter be referred to only in the singular form.

When using an inner valve zone the outer pipe will form a sealing zone and also provide protection against deformation of the inner parts, which in this case are the valve zone and the diaphragm zone. Seen from one end, as in figure 1, the pipe includes the following zones: Zone 1 (P1) is separated in a pressure tight manner from the other zones, and communicates with atmospheric pressure P1 or another pressure reference. During consumption, zone 2(P2) communicates with the user in a pressure tight manner, forming the flow channel for fluids that have passed the valve zone. Zone 3 (P3)

communicates with the fluid in the receptacle, forming the entrance area for the fluid prior to passing the valve zone. When using an outer valve zone, the valve zone, and therefore also zone 3 (P3), is moved to the outside of the outer pipe (see figure 2).

If the invention is to be formed as a straw, the lower open end of the pipe can be closed to flow while at the same time being formed as a point, making it easier to place the straw into a suitable receptacle. The other end can be welded or otherwise processed to ensure that the valve zone above the liquid can no longer be opened. At the same time, the reference pressure zone (P3) of the diaphragm zone can be sealed at the upper end of the pipe and provided with a vent placed e.g. on the upper sidewall of the pipe, which ensures aeration from the atmosphere to the reference pressure area.

The outer pipe described so far can also be provided with a new outer pipe or a profile connected with the rest of the mechanism in a pressure tight manner, making it easier to lead fluids through the valve zone without sucking in additional air if the device is used with a rigid receptacle (see figure 3). The extra profile may be part of the same pipe as previously described, or it may be a self-contained pipe or other profile shape permanently or slidingly fixed to the above mentioned pipe. When fixed in a sliding manner it is possible to achieve a telescope function, which is an advantage if attached to low packing during transport.

Advantageously the outer pipe and its internal components are formed wholly or in part from different materials or different combinations of materials. It may be advantageous to use a rigid material for the external physical protection, while soft materials may be beneficial where the valve faces meet, in order to ensure reliable closing. Apart from this, the selection of materials is not important to the fundamental operation, which constitutes the actual

invention, and as such may be carried out by a person skilled in plastics technology.

In some instances it may be advantageous for the entire device to be manufactured with rotation in the longitudinal direction. This will, among other things, provide greater strength and thereby increased tolerance to damage caused by bending or compression.

The outer pipe may also take other spatial forms than the purely circular. In these cases the outer pipe may be called a profile, with the unlimited number of styles of execution that entails.

The following describes several non-limiting examples of embodiments according to the invention. These have been illustrated in the accompanying drawings, in which figures 1-4 show examples of embodiments according to the invention:

Figure 1a shows a part of a tubular profile 2 according to the invention;

Figures 1b and 1c show section A-A of the above profile 2, figure 1b showing the device in the closed state and figure 1c showing the device in the open state. The valve zone 4 communicates with the diaphragm zone 6, which through the atmospheric pressure P1 represented at the back 12 of the diaphragm zone 6 effects opening of the valve zone 4 when the user applies sufficient underpressure P2 in the passage 18. Upon opening of the valve zone 4 fluids will flow through the feed passage 20. When the underpressure P2 from the user ceases the valve opening force from the diaphragm zone 6 will cease, causing the valve zone 4 to be closed by the bias in the diaphragm zone 6;

Figures 2a and 2b show a section through an alternative execution of a profile according to the invention. Here the valve area 4 has a direction of opening directly out to the fluid in the receptacle. Otherwise, the principle of operation is the same as in figures 1a and 1b;

Figure 3a shows a further execution according to the invention, which has been cut through to show that the inner pipe 1 is provided with an outer pipe 8, which helps carry the fluid to the valve zone 6. The inner pipe 1 is closed at the lower end 22, ensuring that fluid can only pass through the valve zone 6 upon use of activating suction force P2. At the upper end 28 of the pipe 1 the diaphragm zone is welded to the inside wall 30 of the pipe 1, ensuring that atmospheric pressure can only pass through the hole 26;

Figure 3b shows the same device as that described above, but seen from section B-B; and

Figure 3c shows an alternative execution of a profile according to the invention. Here the outer and inner pipes are manufactured from the same profile, but otherwise the operation remains the same as in figure 3a.